THE STARS from YEAR to YEAR

WITH CHARTS FOR EVERY MONTH

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"Why did not somebody teach me the constellations and make me at home in the starry heavens, which are always overhead, and which I don't half know to this day!"

Thomas Carlyle.

THE STARS FROM YEAR TO YEAR.

"There is, above all, in this direct study of the heavens out in the open, beneath the deep unsounded sky, a charm and an awe not to be realised otherwise. It is Nature at her vastest we approach; we look up to her in her most exalted form. We see unrolled before us the volume which the finger of God has written; we stand in the dwelling place of the most High."

E. WALTER MAUNDER.

TO a true lover of Nature it is one of the deepest and purest pleasures to look out into the "huge and thoughtful night." The fret and excitement of the day, the necessary contact with uncongenial minds, the agitating circumstances of human life, all are forgotten in the contemplation of sublimer things, in the calm assurance that we too are a part of the infinite greatness by which we are surrounded, that

"All are but parts of one stupendous whole,
Whose body Nature is, and God the Soul."

The deeper the study, and the more intimate the knowledge obtained of the secret workings of Nature, the more is the mind of man filled with wonder at the marvels of his own life and being, and at the greatness and grandeur of all that lies around him. Each new discovery leads to another, ever revealing the unity and perfection of Law, even in the smallest detail.

The light of this truth beams upon us not only from the starry hosts above, but its beacons flash from every mountain top and hill. It sparkles

upon the dew-drops, and upon the broad bosom of the ocean. It is revealed to us in the colours of the rainbow and the flowers, upon the breast of the humming bird, and upon the wings of the butterfly. It shines for us in the diamonds of the mine.

In comparison with the study of other Sciences, that of Astronomy has made a rapid advance during the last century. The foundations are well laid, the scaffolding is being erected, and soon the walls of the Temple of Knowledge will rise to nobler heights, from which we shall command a wider survey of our surroundings.

Sooner or later, and it may be sooner than we think, the veil now drawn between us and our nearest planetary neighbours will be lifted, and we shall learn whether our own world is, as some suppose, the only possible abode of human life in our own system, or whether our sister planets represent the earlier and later stages of similar worlds, as the younger and older members of our family, one in type, but diversified in character, not necessarily identical.

We may one day be able to point our improved telescopes to those peculiar markings on the face of Mars, which mock us still with their strange mystery, and discover whether they give evidence of an effort on the part of intelligent beings to "utilise to the utmost a fast vanishing water supply," or possibly that they are nothing more than the wrinkles of old age upon the face of a rapidly dying world. Also we may learn if Venus, like a younger earth, is still in the earlier stages of her existence, preparing for the great future awaiting her.

From the contemplation of other worlds in the making, now made possible to us by the wonderful power of telescopic vision, we may obtain some idea of the origin of our own sun and planets from a spiral nebula, which at one time must have extended far beyond the present limits of the Solar System, for as the fine gases of the nebula consolidated, to form the planets, a great shrinkage must, necessarily, have taken place.

Going still further back into the history of past ages, we learn that the nebula itself was probably the result of the near approach of two heavenly bodies, possibly of two dead suns, the smaller of which, within a certain distance from the other ($2\frac{1}{2}$ times its own radius, according to Roche's limit of danger), would break up under the great tidal strain of attraction, to be transfused once more into the fine attenuated gas of a nebula, similar to that from which it had evolved. Or, an oblique grazing collision might have taken place, causing a tremendous explosion, and possibly producing the spiral form of the nebula. In either case it would mean the resurrection into a new life, and the scattering of the seed of

new worlds upon the broad fields of the Universe. The "blaze star" of May, 1866, was an instance of the outburst of a star already in existence.

The above theory also accounts for the presence of comets as members of the Solar System, for many of the fragments of the wrecked sun, or suns, would pass into outer space by the force of the explosion, without being transformed by heat into the great nebulous mass which eventually consolidated into the system of sun and planets as we know it now. In the course of time these fragments would return to, and revolve around the source of their original impulse, some in orbits, the circuit of which would take hundreds and even thousands of years to complete. Donati's comet of 1858, for instance, goes out into space five times the distance of the orbit of Neptune from the sun, and the journey to and fro takes the comet more than 2,000 years to accomplish.

Halley's Comet takes about 76 years to complete its revolution around the sun. Its history has been traced back to the year 240 B.C., and it is the comet of the Norman Conquest in 1066. Edmund Halley was the first to compute its orbit, and to predict its return in 1759. In 1456 the tail was said to be 60 degrees in length, but in 1835 it had considerably diminished. The return of this comet in 1835 was first observed at Rome, on August 6th, by Father Dumonchel, and it was last seen on May 17th, 1836. On Sunday, September 12th, 1909, its re-discovery was announced by Professor Wolf, of Heidelberg, and confirmed by observations at Greenwich, a faint impression of the comet being found upon a photographic plate exposed three nights previously at that Observatory. According to the latest computations of Messrs. Cowell and Crommelin, and others, it will be nearest to the sun on April 20th, 1910, and nearest to the earth about a month later, when its distance will be about 12 million miles.

For the first time in its long history this famous comet will be examined by the spectroscope, that the nature of its composition may be ascertained.

Astronomers tell us that no danger need be anticipated as the result of its near approach. In June, 1861, the earth passed through the tail of the great comet of that year, and was none the worse for the encounter. In November, 1872, the earth collided with Biela's comet in crossing its orbit. The only result was an unusual shower of meteors.

While all the known comets appear to belong to the Solar System there is reason to believe that meteoric and nebulous matter is scattered more or less throughout the Universe, and that comets, and the meteors of which comets are composed, are "miniature specimens of the contents of space," or the "dispersed material of which stars are made."

Meteors, commonly known as "shooting stars," are very small bodies, most of them weighing less than an ounce. A vast number follow the trails of the comets, and they rush into our atmosphere at the height of 100 miles or more, with a speed of from 10 to 40 miles a second. The friction causes them to become incandescent, and they are consumed before they reach the earth.

The two principal annual showers are those of the Perseids, about August 10–12, and the Leonids about November 12—14.

Larger portions of meteoric matter occasionally fall to the earth, some of which have weighed several tons. It is interesting to know that these meteorites are composed more or less of the same elementary substances as those of the earth.

The **Fixed Stars,** so called, are all suns, many of them being much larger than our own sun, but they are at such an immense distance from us that the light from the nearest at present known, Alpha Centauri, in the Southern hemisphere, takes more than four years to reach us, travelling, as light does, at the rate of about 186,000 miles a second. The light from the nearest star in our own hemisphere, in the constellation of Cygnus, takes more than seven years to reach us, while the light from the Pole Star, rushing through space at the same tremendous speed, takes 44 years to accomplish its journey to the earth.

Sirius, in the constellation of Canis Major, is the brightest of all the stars, including those of both hemispheres. It is comparatively one of the nearer stars, yet its light takes more than 8 years to reach us. It is about 500,000 times the distance of the sun from the earth, but it is gaining upon us at the rate of nearly 10 miles a second, and must therefore be travelling considerably faster than the Solar System, as the sun is moving in the opposite direction from this star towards Vega, at a speed of about $12\frac{1}{2}$ miles a second. The "dog days," from July 3rd to August 11th, are so called because Sirius, the Dog Star, at one time rose with the sun at that period. Sirius is also called the Nile Star, as it appears in the Southern hemisphere with the rising of the Nile.

Canopus, the most brilliant star in the Southern hemisphere, is second only to Sirius in brightness, and yet is so far distant that it is beyond the present limit of measurement. No parallax whatever can be obtained. Its size, therefore, must be immense.

Arcturus, the large bright star in Boötes, the Herdsman, is so far distant that its light takes more than 100 years to reach us. It is one of the most swiftly moving stars we know, its motion being at the rate of about 250 miles a second.

The light of the bright star **Capella,** in Auriga the Charioteer, takes 23 years to reach us. This star is classed with the sun as one of the yellow stars in the prime of life. The younger stars are white, or bluish white. As they grow older their colour deepens from yellow to red, until their light goes out altogether.

Vega, the beautiful star in Lyra, is distant from us about 30 "light years." Light, that is to say, takes 30 years to travel to the earth from that star. The point in the heavens towards which the sun is now moving, called the "apex of the sun's way," is believed to be about 4 degrees from Vega, which in 12,000 years will be the Pole Star.

The light from **Alcyone,** the central star in the Pleiades, takes more than 250 years to reach us. Six of the sister stars can be plainly seen by the naked eye, but the seventh, supposed to be the "lost Pleiad," is now very faint. A large telescope reveals between two and three thousand stars in this beautiful cluster, which covers, in the heavens, not quite one square degree. From the similar motion of several stars in the cluster around Alcyone it was thought by a noted Astronomer that the whole Universe probably revolved around this central star, but there is no sufficient foundation for such a belief.

Owing to the earth's daily rotation on its axis from West to East, at the speed of about 17 miles a minute, (at the equator), or 15 degrees an hour, the constellations appear to revolve around the Celestial poles once in every 24 hours, from East to West.

It will be observed that a certain number of stars immediately surrounding the poles never set, and, as a guide to all the other constellations, a few of these may be selected, to form an imaginary gigantic clock. For the North Celestial clock, the Pole Star, as the centre, may be readily found by means of the two front stars of the Plough, (in Ursa Major), called the "Pointers," as they point almost directly to it without any intervening star. For the four quarters, the Plough on one side of the Pole Star, and Cassiopeia, the "W" on the opposite side may be chosen with the two bright stars, Vega and Capella, which are also opposite to each other.

The constellations appear to revolve as one great whole, so that their positions with respect to each other never change, but while the Pole Star itself remains practically stationary, we shall find that the four different quarters of the imaginary clock will, during the year, be directed in rotation to the four points of the compass, so that every six months their positions in the sky are exactly reversed. They move, however, in the opposite direction to that of the hands of an ordinary clock.

The stars rise a little earlier every day, for the reason that their return to the same meridian takes place sooner than that of the "mean" sun by about four minutes. This makes a difference of two hours during the month in the position of the stars.

The Planets of the Solar System cannot be included in these permanent maps of the fixed stars, for being so much nearer to us they appear to "wander," as their name implies, between us and the background of the far distant stars.

They are always found, however, within a few degrees of the Ecliptic, the sun's apparent pathway around the twelve Constellations of the Zodiac, which are so-called because many of their names are those of animals, viz.: Aries, the Ram; Taurus, the Bull; Gemini, the Twins; Cancer, the Crab; Leo, the Lion; Virgo, the Virgin; Libra, the Scales; Scorpio, the Scorpion; Sagittarius, the Archer; Capricornus, the Goat; Aquarius, the Water Bearer; and Pisces, the Fishes.

The constantly varying positions, from year to year, of the planets may be ascertained from the Star Sheet Almanac.* They shine with a softer light, and do not twinkle, unless they are near to the horizon where the atmosphere is more dense. Also they show a disc when magnified, whereas the stars are so far distant that they appear as points only, even through the most powerful telescope.

The accompanying **Star Charts** represent the principal constellations as they appear about the middle of each month at 10 p.m. Earlier than this time those stars on the East of the map will not have risen. Later, those on the West will have disappeared. The centre of the Charts represents the zenith, and the outer circle, the horizon.

The best equipment for the study of the constellations is a hammock chair, a warm rug, a bicycle lamp, or some shaded light for reference to the Charts, and last, but not least, an observant eye, and an enthusiastic mind.

Many a delightful hour may be thus enjoyed in the contemplation of the "wondrous glory of the stars," and, while learning that life and matter, ever evolving from one stage to another, are yet never destroyed, shall we not be led, as a natural sequence, to the full and utterly reasonable belief in the continued and progressive life of the spirit, as well as to a deeper trust and confidence in a Divine Creator and Upholder of all things!

(See Table of Sun, Moon, and Planets, page 23).

*"The Star Almanac," price 3d., King, Sell & Olding, 27, Chancery Lane, London.

The Evening Sky in JANUARY.

The centre of the Charts represents the zenith, and the outer circle, the horizon.

"By the word of the Lord were the heavens made, and all the host of them by the breath of His mouth."

The Evening Sky in FEBRUARY.

"In this sublimest pageant is a revelation of the same spirit, the same order that animates the dust. And this spirit, this order man recognizes among the stars because he is himself its child."—*Basil de Sèlincourt.*

The Evening Sky in MARCH.

"The fire is in them whereof we are born,
The music of their motion may be ours."

(Meditation under the Stars). — *Geo. Meredith.*

The Evening Sky in APRIL.

"We are a part of the Universe, and the Universe is a part of God."
—*Sir Oliver Lodge.*

The Evening Sky in MAY.

"It is Astronomy which will eventually be the chief educator and emancipator of the race."—*Sir Edwin Arnold.*

The Evening Sky in JUNE.

"I found Him in the shining of the stars,
I marked Him in the flowering of His fields."
—*Tennyson.*

The Evening Sky in JULY.

"As sparks mount upward from the fiery blaze,
So suns are born, so worlds spring forth from Thee!"
—*Russian Ode, Deykezin.*

The Evening Sky in AUGUST.

"I know of no way in which mind can be so entirely relieved of the burden of all human anxiety, as by the contemplation of the starry heavens."—*Professor Simon Newcomb.*

The Evening Sky in SEPTEMBER.

"Is not the survival of the existence of the soul the logical complement of Astronomy?"—*Camille Flammarion.*

The Evening Sky in OCTOBER.

"The indirect benefits of Astronomy in enriching our intellectual experience are not surpassed by those of any other Science."—*Forest Ray Moulton.*

The Evening Sky in NOVEMBER.

"There are two things that strike my soul with awe, the starry heavens, and the sense of ought within the human soul."—*Kant.*

The Evening Sky in DECEMBER.

"The winter sunset fronts the North,
The light deserts the quiet sky;
From their far gates how silently
The stars of evening tremble forth!"

—*G. Sterling.*

Constellations surrounding the South Pole.

"Our life is but a little holding, lent
To do a mighty labour: We are one
With heaven and the stars when it is spent
To serve God's aim, else die we with the sun."

—*Geo. Meredith.*

Aspect of the Southern Sky to a traveller from the Northern Hemisphere.

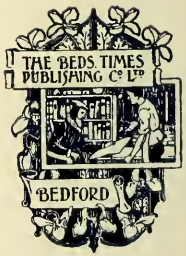
In the Southern sky the positions of the heavenly bodies are reversed, and the old familiar stars appear to go round to the West by way of the North, instead of by way of the South, as in the Northern sky.

Table of the Sun, Moon, and Planets.

Diameter.	Rotation.	Distance from Earth.
SUN, 866,000 miles ...	25½ days at the Equator	About 93 million miles.
MOON, 2,163 ,, ...	Rotates upon its axis, and revolves around the earth at the same time, in about 28 days. ...	240,000 miles.

Planet.	No. of Satellites.	Diameter.	Rotation.	Revolution.	Mean Distance from Sun.
MERCURY,	None	3,000 miles	88 days	88 days	36 million miles.
VENUS,	None	7,700 ,,	24 hrs. (?)	225 ,,	67 ,, ,,
EARTH,	1	8,000 ,,	24 ,,	365 ,,	93 ,, ,,
MARS,	2	4,200 ,,	24½ ,,	687 ,,	141 ,, ,,
ASTEROIDS,	—	—	—	—	—
JUPITER,	8	86,500 ,,	9 h. 55 m.	11 years	483 ,, ,,
SATURN,	10	74,000 ,,	10½ hrs.	29½ ,,	886 ,, ,,
URANUS,	4	31,900 ,,	10-12 hrs. (?)	84 ,,	1,800 ,, ,,
NEPTUNE,	1	37,000 ,,	13 hrs. (?)	164 ,,	2,800 ,, ,,

The above approximate figures are obtained from the best and most recent authorities, but in some cases, as in the rotation period of Venus, Uranus, and Neptune, there is at present no absolute certainty.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